RIAA, et al.-T-1

BEFORE THE
POSTAL RATE COMMISSION
WASHINGTON, D.C. 20268-0001

POSTAL RATE AND FEE CHANGES, 1997	)))	**Docket No. R97-1**

Direct Testimony
of
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On Behalf Of
RECORDING INDUSTRY ASSOCIATION OF AMERICA
And
ADVERTISING MAIL MARKETING ASSOCIATION

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OF
GARY M. ANDREW

I. INTRODUCTION

My name is Gary M. Andrew. I am Senior Consultant with the firm of L. E. Peabody & Associates, Inc. The firm's offices are located at 1501 Duke Street, Suite 200, Alexandria, Virginia 22314. I have, on numerous prior occasions, presented evidence before the Interstate Commerce Commission (now the Surface Transportation Board) and state agencies on the subjects of measurement and optimization of economic systems. I presented evidence before the Postal Rate Commission ("PRC") in Docket No. R90-1, Postal Rate and Fee Changes, 1990 ("R90-1") related to the proper measurement of the United States Postal Service's ("USPS") attributable costs. In PRC Docket No. R94-1, Postal Rate and Fee Changes, 1994, I submitted evidence on rate design and its impact on third class bulk mailers. My qualifications and experience are detailed in Appendix A to this statement.

I have been requested by the Recording Industry Association of America and the Advertising Mail Marketing Association, (hereinafter referred to collectively as "RIAA, et al.") to review the testimony of the witnesses for the USPS related to the USPS' proposed surcharge of 10 cents per piece for parcels ("surcharge") in Standard (A) mail. In particular, I have reviewed the testimony, workpapers, library references, and responses to interrogatories of USPS' Witnesses Crum, Moeller, Bradley, Daniel, and Smith as that material relates to the development of the surcharge for parcels. Finally, where additional data was required, I have relied on publicly available data and material furnished by RIAA, et al.

The balance of my testimony is organized under the following topical headings:

II. Purpose of the Testimony

III. Summary and Findings

IV. Analysis of Revenues for Parcels and Flats

V. Mail Processing Costs

VI. Transportation Costs

II. PURPOSE OF THE TESTIMONY

RIAA, et al. asked me to examine all data, analyses and assumptions used by the USPS in PRC Docket No. R97-1 to support the surcharge on Standard (A) parcels. Furthermore, I was asked to examine any available data and theory not presented by the USPS that might indicate if the surcharge is justified based on the cost and revenue differential between parcels and other nonletter mail (i.e., flats). Finally, I was asked to restate the USPS' proposed surcharge based on the maximum surcharge warranted.

My analyses are divided into two major categories. My first analysis examined the revenue per piece generated by an average parcel and an average flat. Using the same averaging methods that were used by Witness Crum to develop costs and using Witness Crum's Revenue, Piece and Weight ("RPW") tables, I have developed the differential in revenues, without the surcharge, between parcels and flats.

My second analysis was the examination of the data and analyses developed in support of the surcharge by Witness Crum (USPS-T-28) and used by Witness Moeller (USPS-T-36). The USPS' support contains errors and relies upon data obtained through sampling procedures that contain significant bias. I have corrected the errors and bias and used the more reliable estimates.

III. SUMMARY AND FINDINGS

Based on a thorough review of the testimony submitted by USPS, the support for that testimony and the data made available to me, I conclude that the 10 cents per piece surcharge for Standard (A) parcels is not justified. The results of my analyses are summarized below.

1. The USPS' analysis shows a cost differential between the average flat mail and average parcel mail in the Standard(A) Class of 33.4 cents per piece;

2. The USPS' analysis ignores that, on average, parcels weigh 8.35 ounces while flats weigh 3.32 ounces. This difference in weight contributes to the difference in revenue between parcels and flats. The USPS' conclusions and recommendations ignore the 24.6 cents per piece that parcel revenues exceed flat revenues;

3. The variability for mail processing costs as determined by Witness Bradley is improperly applied by Witness Crum. This error overstates the difference in costs between parcels and flats for mail processing by 2.3 cents per piece;

4. The USPS' analysis contains errors in the sampling procedures which impacts the allocation of costs to parcels. This error overstates the difference in costs between parcels and flats for transportation and vehicle service driver costs by 3.3 cents per piece; and,

5. The maximum surcharge for parcels that can be justified using Witness Crum's methodology and available data is 3.2 cents per piece (33.4 cents per piece less the revenue differential of 24.6 cents per piece, the overstatement in mail procession costs of 2.3 cents per piece and the overstatement of transportation and vehicle service drivers costs of 3.3 cents per piece); and,

6. Although the surcharge warranted based on the cost and revenue differential equals 3.2 cents per piece, RIAA, et al. has asked me to identify the surcharge that could be applied to parcels which would not alter the base rates proposed by USPS' Witness Moeller for Standard (A) Commercial Regular and Enhanced Carrier Route ("ECR") mail. The surcharge to avoid adjustment to Witness Moeller's base rates equals 8.9 cents per piece.

IV. ANALYSIS OF REVENUES FOR PARCELS AND FLATS

The evidence submitted by the USPS in support of the 10 cents per piece surcharge on all Standard (A) parcels only considers the difference between the USPS calculated costs of parcels and of flats. Neither Witness Crum (USPS-T-28) nor Witness Moeller (USPS-T-36) consider the additional revenue generated by Standard (A) parcels when compared with Standard (A) flats. This difference in revenue is due, in large part, to the significant difference in the average weight of parcels and flats.[1/] This additional revenue should be a direct offset against any alleged difference between parcels and flats because, to the extent that current revenues offset cost differences, no surcharge is warranted.

I have computed the average additional revenue per piece generated by parcels over flats; identified the primary source of the additional revenue, and determined that the additional revenue has been stable over the past four years (where data are available). These results are discussed in the following sections:

A. Computation of Revenues for Parcels and Flats

B. Sources of Difference in Revenue

C. Revenue Difference Over Time

[1/] Witness Crum does make adjustments in costs to reflect the differences between parcels and flats due to the level of dropshipping and presortation.

A. COMPUTATION OF REVENUES FOR PARCELS AND FLATS

The method that I have used for computing the average revenues generated by parcels and flats is analogous to the method used by the USPS to develop average costs per piece for each of these two shapes. Witness Crum (USPS-T-28 at pages 10 through 12 and Exhibit K) computes the average cost of a Standard (A) parcel in 1996 by aggregating the costs distributed to parcels for the four subclasses in Standard (A) mail (Commercial/Non-Profit versus ECR/Other) and dividing by the total number of parcels in these four subclasses in 1996. A similar calculation of aggregate costs of flats divided by the aggregate number of flats yields the average cost of a Standard (A) flat. Witness Crum then calculates the difference of these two averages and makes adjustments to account for the differences in dropshipping and presortation between flats and parcels.

In an analogous manner, I computed the average revenues for parcels and flats by aggregating the revenues generated by each shape over the four subclasses of Standard (A) mail and dividing the total revenues by the total number of pieces of the respective shape.[2/] The results of these calculations are shown in Table 1 below.

[2/] My revenue analyses are restricted to Base Year 1996 revenues because the USPS, in Witness Moeller's responses to PSA/USPS-T36-4, PSA/USPS-T36-5 and redirected PSA/USPS-T26-1, has stated that data are not available to compute both revenues and costs by shape for the 1998 Test Year After Rates ("TYAR98"). Likewise, I have maintained all costs at Base Year levels. I used the cost levels in USPS-T-28K Tables 3 (series), i.e., I did not multiply the cost difference by the test year/base year wage rate adjustment factor of 1.053 as Witness Crum did at USPS-T-28 page 11. Witness Crum's adjustment of 7.3 cents per piece for dropshipping and presortation (USPS-T-28K Table 7) is restated at the Base Year cost level and equals 6.9 cents per piece (7.3 cents per piece ÷ factor of 1.053 ratio of test year to base year).

Table 1

Standard (A) Average Revenue Per Piece by Shape

(Cents per Piece)

Item (1)	Commercial (2)	Non-Profit (3)	Standard (A) (4)
1. Parcel	44.18¢	26.08¢	43.37¢
2. Flat	19.04	15.50	18.77
3. Difference (Line 1-Line 2)	25.14¢	10.58¢	24.60¢

Sources:
Column (2): USPS-T-28K, Table 1, Controlled to GFY RPW; Revenue ÷ Pieces.
Column (3): USPS-T-28K, Table 2, Controlled to GFY RPW; Revenue ÷ Pieces.
Column (4): USPS-T-28K, Table 1 plus Table 2, Controlled to GFY RPW; Revenue ÷ Pieces

For Standard (A) parcels the average revenue equals 43.4 cents per piece. The average revenue for Standard (A) flats equals 18.8 cents per piece. The difference in the average revenue between parcels and flats equals 24.6 cents per piece. The 24.6 cents per piece of additional revenue generated by parcels over flats must be considered in the development of a surcharge that uses the cost difference method presented by Witness Crum.

Average revenues computed from the actual 1996 Revenue, Pieces and Weight ("RPW") do not require any adjustment. The average revenues reflect the mix of dropshipping and presortation that actually occurred in 1996. These revenues and differences can be compared with the adjusted average cost differences developed by Witness Crum and corrected in Sections V and VI below. .

B. SOURCES OF DIFFERENCE IN REVENUE

The primary difference in the revenue generated by parcels versus flats is caused by the difference in average weight per piece. The average weight per piece for parcels and flats are shown in Table 2 below.

Table 2
Standard (A) Average Weight Per Piece by Shape
(Ounces per Piece)

Shape (1)	Commercial (2)	Non-Profit (3)	Standard (A) (4)
1. Parcel	8.45	6.29	8.35
2. Flat	3.39	2.46	3.32
3. Difference (Line 1-Line 2)	5.06	3.83	5.03

Sources:
Column (2): USPS-T-28K, Table 1, Controlled to GFY RPW; (Weight x 16 ounces) ÷ Pieces.
Column (3): USPS-T-28K, Table 2, Controlled to GFY RPW; (Weight x 16 ounces) ÷ Pieces.
Column (4): USPS-T-28K, Tables 1 plus Table 2, Controlled to GFY RPW; (Weight x 16 ounces) ÷ Pieces.

The average weight of a Standard (A) parcel equals 8.35 ounces while the average flat weighs 3.32 ounces. At the 1996 rates these weight differences account for a portion of the difference in revenue.

C. <u>REVENUE DIFFERENCE OVER TIME</u>

The difference in average revenue per piece generated by parcels versus flats has been steadily increasing over the past four years. The difference in average revenue per piece between parcels and flats is displayed graphically in Exhibit ___ (RIAA, et al.-1A). The data for Standard (A) Commercial mail is the only data available for multiple years; however, the two (2) subclasses for Standard (A) Commercial parcels comprise 95.5% of the total Standard (A) parcels. Therefore, I conclude that the 24.6 cents per piece premium paid by parcels over flats in 1996 is consistent with the trend since 1993.

V. MAIL PROCESSING COSTS

A substantial portion of the total cost difference between parcels and flats of 33.4 cents per piece[3/] as developed by Witness Crum is associated with cost segment 3.1, mail processing. The mail processing component of Witness Crum's estimates of cost by shape contains four separate sets of costs[4/]:

1. Management Operating Data System ("MODS") Office Cost Pools;
2. Bulk Mail Center ("BMC") Cost Pools;
3. Non-MODS Offices Aggregate Costs; and,
4. Remote Encoding Costs.

In Witness Crum's analysis, the four cost groups were distributed between letters, flats and parcels based on Library Reference LR-H-106. A summary of the mail processing costs developed by Witness Crum, on an aggregate and per piece basis, by shape of mail is summarized in Table 3 below.

3/ These are the 1996 costs developed in USPS-T-28K Table 3 and reduced by the 1996 value for the dropship and presort discount cost difference of 6.9 cents per piece (7.3 cents per piece from USPS-T-28K Table 7 divided by the test year/base year wage rate adjustment factor 1.053).

4/ Witness Crum's (USPS-T-28), Exhibit K, Table 3, line 3.1 (Also known as LR-H-108). The components of mail processing costs are shown in the tables on pages II-1, III-1, and IV-1 of LR-H-106.

The cells with the % signs in them have been formatting with the table Number Format "Percent" and the % appears automatically.

Table 3
Summary of Witness Crum's Mail Processing Costs by Shape

Item (1)	Aggregate Costs (000) (2)	No. of Pieces (000) (3)	Cost Per Piece (cents) (4)
1. Letters	$1,726,169	41,865,345	4.12¢
2. Flats	1,417,869	28,692,335	4.94
3. Parcels	278,593	982,647	28.35
4. Total	$3,422,631	71,540,328	4.78¢

Source:
Column (2): USPS-T-28K Table 3 line C.S.3.1 Total.
Column (3): USPS-T-28K Table 3 line Distribution Key 1 Volume of Mail.
Column (4): Column (2) divided by Column (3).

In total, mail processing costs equal $3.42 billion for 71.54 billion pieces or an average mail processing costs of 4.78 cents per piece. Witness Crum's mail processing costs for parcels equals 28.35 cents per piece while the mail processing costs for flats equals 4.94 cents per piece. The difference between flats and parcels, as shown by Witness Crum, equals 23.41 cents per piece.[5/]

[5/] 28.35 cents per piece for parcels less 4.94 cents per piece for flats.

For purposes of my analysis, I have accepted the mail processing costs utilized by Witness Crum for MODS[6/] office costs, BMC costs, and remote encoding costs. However, the procedures relied on by the USPS' witnesses to develop Non-MODS costs are in error and misstate the allocation of costs between letters, flats and parcels.

In developing his analysis, Witness Crum has relied on USPS Witness Bradley (USPS-T-14) and USPS Witness Smith (USPS-T-45) to determine the variability (i.e., attribution) of mail processing costs and the separation of costs between letters, flats and parcels (i.e., distribution). In utilizing these attribution/distribution factors, Witness Crum has relied on inaccurate data related to the Non-MODS office aggregate costs.

My explanation of the error in the USPS' analysis and my restatement of mail processing costs are discussed under the following topics:

A. Witness Bradley's Non-MODS Office Volume Variability

B. Witness Smith's Distribution of Non-MODS Office Variable Costs

C. Restatement of Mail Processing Costs.

[6/] A "MODS" office is a post office with a Management Operating Data System installed. A Non-MODS office is a post office without an installed Management Operating Data System.

A. WITNESS BRADLEY'S NON-MODS OFFICE VOLUME VARIABILITY

Witness Bradley states:

> There is currently no system for recording hours and piece-handlings for individual activities in non-MODS offices. Because detailed information about the activities taking place in non-MODS offices is not available, the average or system variability from MODS offices will be applied to the overall mail processing costs for non-MODS offices. (USPS-T-14, page 90)

In other words, Witness Bradley assumed that the overall average variability for MODS offices of 78.7 percent[7/] was applicable to the costs in Non-MODS offices. The variability percentage has a direct impact on the cost differential between flats and parcels because the higher the variability, the higher the cost per piece and, therefore, the greater the absolute difference between the costs distributed to flats and parcels.

The use of the above described chain of computations as part of the determination of the difference between the unit costs of flats and the unit costs of parcels is clearly flawed. Witness Crum identifies a similar flaw in another's analysis but not his own. In his response to NDMS/USPS-T28-35 he notes that "Parcels can be delivered by a rural carrier or a city carrier, but not both. That mix might be very different by subclass." However, Witness Crum ignores or fails to identify, the similar flaw in his own analysis, namely, the mix of costs and variabilities may be very different between MODS and Non-MODS Offices as well as the mix of flats and parcels.

[7/] Bradley Exhibit USPS-14B, page 2 of 2.

The implicit and unsupported assumption that is made in the use of the MODS system average variability in all Non-MODS cost pools is that the mix of costs in the Non-MODS offices and the variabilities of these costs must remain the same and the relative magnitudes of the cost pools are equal. This may produce a proxy for overall variability, but certainly should not be used as the basis for determining the difference between the costs of flats versus parcels.

B. WITNESS SMITH'S DISTRIBUTION OF NON-MODS OFFICE VARIABLE COSTS

USPS Witness Smith distributes the mail processing variable costs by subclass and shape in LR-H-146 and, with adjustment, in LR-H-106. The problems with Witness Smith's distribution are twofold. First, the volume variable costs for Non-MODS offices are computed by multiplying the attributable cost for each Non-Mods cost pool by the "system variability" developed by Witness Bradly.[8] The "system variability" was derived from MODS-offices and there is no evidence presented by the Postal Service to show that this system variability is applicable to Non-MODS-offices, even in the aggregate.

Second, the accuracy of the estimate of the variable cost by shape is dependent upon computing the variable costs at the cost pool level (i.e., attributable cost in each cost pool multiplied by the volume variability of the respective cost pool). The set of cost pools in MODS offices can differ in four ways from the set of cost pools in Non-MODS offices: (1) different number of pools; (2) different composition of pools; (3) different relative sizes of pools; and, (4) different variabilities of the costs in the pools. However, the single MODS office system

[8] LR-H-146 Program listing page 0101 and 0111.

average variability was used for every Non-MODS office cost pool. This causes loss of individual and proper weighting of the distribution key by cost pool variability. The resulting distributed costs are by shape (letter, flats and parcels) of the Non-MODS offices in LR-H-106 and the contribution to the alleged difference between the costs of parcels and flats are therefore meaningless.

C. RESTATEMENT OF MAIL PROCESSING COSTS

I corrected for the unproven contribution to the parcel-flat cost differential of mail processing costs in Non-MODS offices by making one adjustment. For each subclass, the Non-MODS office costs were aggregated and redistributed to shape proportional to the number of pieces.[9] The volume variable costs for MODS offices, BMC's, and remote encoding costs have been accepted as developed by Witness Smith and utilized by Witness Crum.

This procedure allows the total volume variable costs to remain unchanged but prevents the variable costs of the Non-MODS office from contributing to the difference between costs of parcels and the costs of flats. My restatement of mail processing costs is summarized in Table 4 below:

[9] This step is included in RIAA, et al.-LR-1, Spreadsheet 108_new.xls sheets BrCrt, BrOth, NpCrt, and NpOth at lines 3.1a and 3.1aa. Spreadsheet CSTshpMOD1.xls sheets Adj.Letter, Adj.Flatest, and Adj.Parcelcst contain the source of the Non-MODS costs per NDMS/USPS-T28-11.

Table 4
Restatement of Mail Processing
Costs to Current Non-MODS Office Costs

Item (1)	Aggregate Costs (000) (2)	No. of Pieces (000) (3)	Costs Per Piece[1/] (4)
1. Letters	$1,835,648	41,865,345	4.38¢
2. Flats	1,334,194	28,692,335	4.65
3. Parcels	252,789	982,647	25.73
4. Total	$3,422,631	71,540,328	4.78¢

Sources:
Column (2) and Column (3): RIAA, et al.-LR-1; spreadsheet 108_new.xls, page All, line 3.1 Total and line Distribution Key 1, Volume of Mail, respectively.
Column (4): Column (2) ÷ Column (3).

Based on my restatement, the overall average cost for mail processing remains the same (i.e., 4.78 cents per piece). The restated costs equal 4.65 cents per piece for flats and 25.73 cents per piece for parcels.[10/]

The difference in mail processing costs between flats and parcels based on Witness Crum's analysis and my restatement is summarized in Table 5 below:

[10/] In this analysis the mail processing cost of letters increase from 4.12 cents per piece to 4.38 cents per piece. This difference does not impact the calculation of the parcel surcharge.

Table 5

Summary of Mail Processing Cost For Parcels and Flats

Item (1)	Cents Per Piece Witness Crum[1/] (2)	Restated[2/] (3)
1. Parcels	28.35¢	25.73¢
2. Flats	4.94	4.65
3. Difference (Line 1 - Line 2)	23.41¢	21.08¢
4. Net Change (Line 3, Column (2) minus Line 3, Column (3))	xxx	2.33¢

[1/] Table 3 above
[2/] Table 4 above

The result of removing the impact of the unsupported assumption regarding costs in Non-MODS offices is that 2.33 cents of the 33.4 cents that Witness Crum alleges is the additional costs of parcels above flats may actually be due to difference in the mix of costs between MODS and Non-MODS facilities. To correct for his unsupported assumption, I have reduced the difference by 2.33 cents.

VI. TRANSPORTATION COSTS

In the USPS' study of the costs of Standard (A) mail by shape, transportation costs incurred by highway and railroad movements and vehicle service drivers are distributed to letters, flats and parcels based on the distribution of cubic feet ("cube") of mail in each respective shape.[11/] However, unlike weight, the cubic feet of the mail flows is not measured by any of the ongoing data collection systems of the USPS. In the study used by Witness Crum to support the ten cent per piece parcel surcharge, the cubic feet of each shape is estimated by dividing the total weight of the shape by the average density of the shape.[12/] In this proceeding, the average density of letters and the average density of flats were based on a specific study performed as part of PRC Docket No. MC95-1, while the average density of parcels was based on a study conducted for PRC Docket MC97-2 utilizing a completely different methodology.[13/]

The average density of parcels determined by the density study in PRC Docket No. MC95-1 equals 14.9 pounds per cubic foot. In the current proceeding, Witness Crum uses the average density for parcels of 8.1 pounds per cubic foot, the same density estimated in LR-PCR-38 of MC97-2. This revised parcel density is only 54% of the parcel density estimated in MC95-1. In the following sections, I will demonstrate that the method used to estimate the density of parcels in PRC Docket MC97-2 (as shown in LR-PCR-38 in that proceeding) has a built in bias toward selection of samples with low densities.

[11/] USPS-T-28, Exhibit K, Table 3 lines C.S.8a, C.S.14.1b and C.S.14.1c.
[12/] USPS-T-28, Exhibit K, Table 3, Distribution Keys, line 4.
[13/] USPS-T-28, Exhibit K, Table 3, Distribution Keys, line 3; and response to RIAA/USPS-T28-8.

Because of concerns over the discrepancies between the two studies, I performed two analyses to evaluate the USPS' studies. First, I reviewed recent research in the physics of granular materials to determine if the method of sample selection used in LR-PCR-38 results in a bias in average density. Second, I gathered actual data from mailers of large numbers of parcels.

My review and analyses are discussed below under the following headings:

A. MC95-1 Estimates of Densities for All Shapes

B. MC97-2 Estimate of Density for Parcels

C. Physics of Granular Material

D. Data from Current Mailers

E. Correction of Cube Distribution Key

F. Conclusions

A. MC95-1 ESTIMATES OF DENSITIES FOR ALL SHAPES

Library Reference MCR-13 in MC95-1 describes the sampling procedure used to obtain the estimates of average densities of letters, flats, and parcels. Exhibit__(RIAA, et al.-1B) contains excerpts of the instructions for selection of the sample and measurement of weight and cube.

In the MC95-1 study, a sample consisted of weighing a container of known volume (and tare weight) containing pieces of a given shape (letters, flats or parcels). This procedure is a straightforward approach that approximates the actual packing behavior of the mail in transportation and, therefore, measures the effective density of the shapes as that mail is transported. The resulting estimates of average density by shape for Standard (A) mail using the sampling procedure in MC95-1 are shown in Table 6 below:

Table 6
Summary of Average Density in MC95-1

Item (1)	Pounds/Cubic Foot (2)
1. Letters	28.4
2. Flats	20.7
3. Parcels	14.9

Source: MC95-1, LR-MCR-13 page 1 (Bates 3); and supplement page labelled "P&DC Density by Class and Shape"; line = OBS 10

The estimates in MC95-1 were not disaggregated by subclass. Witness Crum chose to use the estimates of density from MC95-1 for letters and flats but not parcels.

B. MC97-2 ESTIMATE OF DENSITY FOR PARCELS

Library Reference PCR-38 in MC97-2 describes the research used to obtain estimates of the characteristics of Standard (A) mail parcels. Forms numbered 1, 2 and 3, included as Exhibit ___ (RIAA, et al.-1C), contain instructions for selecting, measuring the dimensions, and weighing each sample. Several problems occur when individual parcels are selected and measured by the method described on these forms.

The first problem is the variation in interpretation of instructions on how to measure a parcel that is not strictly rectangular in shape. Witness Crum admits that such variation is possible. Tr.17/8047-8050. Misinterpretation of the instructions may result in an overstatement of the cube and an understatement of the estimate of density. For example, in the parcel described in an exhibit[14/] used in the cross examination of Witness Crum, mismeasurement of the width results in a downward bias of 24% in the estimate of the density as shown below.

Table 7

Example of Measurement Bias for Parcels

Item (1)	Length (inches) (2)	Width (inches) (3)	Height (inches) (4)	Weight (ounces) (5)	Density (lb./cubic ft)[1/] (6)
1. Correct	5.125	5.875	1.250	10.5	30.13
2. Width Error	5.125	7.750	1.250	10.5	22.84
3. Difference	0.000	(-)1.875	0.000	0.0	7.29
4. Percent	xxx	xxx	xxx	xxx	24%[2/]

[1/] [Column(5) ÷ 16 ounces/pound] ÷ [(Column(2) x Column(3) x Column(4)) ÷ 1728 inches/cubic foot]

[2/] Line 3 ÷ Line 1

As shown in Table 7 above, when the density is calculated using the apparent longest width, the density equals 22.84 pounds per cubic foot. If the correct shape is recorded, the density equals 30.13 pounds per cubic foot. This indicates a bias of 24 percent toward less dense parcels. Similarly, any upward rounding of any dimension will result in an analogous bias in the resulting estimate.

[14/] See AMMA-XE-1, Tr.17/8053 which is included here as Exhibit__(RIAA, et al.-1D).

The second flaw in the methodology used in LR-PCR-38 was the method of selecting a parcel from a container of non-identical pieces. The instructions on Form 3 of Exhibit ___ (RIAA, et al.-1C) read:

> After superficially looking at the mailing, select the most common piece in the mailing. Roughly estimate the pieces of this type as a percentage of the total mailing. Sample this piece first and record the estimate and sample information in the first row of the table. Continue sampling the most common pieces in the mailing in the order of their occurrence until you have sampled a total of five (5) pieces. If there are fewer than five different piece types, sample only one of each type and record the estimate and sample in the appropriate line of the table.

A superficial look will only encounter the parcels in the upper portion of the container, i.e., the parcels on top. The next section of my testimony will present evidence that shows that such a procedure will bias the observed sample to less dense parcels.

Third, a problem also occurs when you compare a sample unit from MC97-2 (a single parcel) with a sample unit from MC95-1 (a container of many parcels). Any comparison of sample sizes must consider this difference.

In summary, the estimated density for all Standard (A) parcels using the MC97-2 method is 8.1 pounds per cubic foot and is only 54 percent of the estimate obtained using the very practical method of MC95-1. This large discrepancy, when considered with the evidence in the next section, points to the serious downward bias of estimated density when using the methods of MC97-1 to sample parcels, measure their dimensions, and estimate the average density.

C. PHYSICS OF GRANULAR MATERIAL

Recent research[15/] in the physics of granular materials provides both experimental and theoretical evidence that non-connected objects of dissimilar size in a container that is subjected to vibrations will separate. In the mail stream, a container of mixed parcels has dissimilar sizes and the vibration is supplied by transportation and handling of containers. The objects with the larger volume will move towards the top and the objects with lesser volume will move towards the bottom of the container. There are two phenomena operating that cause this separation. The first is a convective condition that occurs within the container caused by the vibration. The second is a trapping effect that occurs when a larger volume object reaches the top of the convention cycle and is trapped or unable to ride the down portion of the connective cycle.

The trapping phenomena is independent of density; however, in the case of Standard (A) mail, the maximum weight of a parcel is 16 ounces. The pieces with the larger cube at a given weight will always tend to separate to the top. These are the less dense pieces as can be seen from the RIAA, et al. study data summarized in Exhibit __ (RIAA, et al.-1-F), line 23 versus line 20. The parcel on line 23 has a weight of 0.770 pounds, a cube of 86.13 cubic inches (13.00 x 6.625 x 1.00) and a resulting density of 15.449 pounds per cubic foot. The parcel on line 20 has the same weight, but has a cube of 53.79 cubic inches (5.313 x 6.000 x 1.688) and a resulting density of 24.737 pounds per cubic foot. Since the density is inversely related to the volume for fixed weight[16/], the less dense items will have higher volumes for the same weight.

[15/] Exhibit __(RIAA, et al.-1E) contains a bibliography of papers describing this research. These articles have been included in Library Reference RIAA, et al.-LR-1.

[16/] Exhibit __ (RIAA, et al.-1G) shows the cube - density relationship for a given weight of 0.770 pounds.

The physics of granular materials predicts the large volume parcels will appear on the top of a container and, given the one pound weight limitation on Standard (A) mail, these large parcels will have lower than average density. Therefore, the sampling scheme used in LR-PCR-38 in MC97-2 will tend to be biased toward less dense pieces and the results should not be used. The use of the density estimates from this biased study will shift costs from letters and flats to parcels.

D. <u>DATA FROM CURRENT MAILERS</u>

Because of the discrepancies between the density of parcels developed in MC95-1 and MC97-2, I was requested by RIAA, et al. to gather actual data from the parcel shippers represented by these organizations. I was provided 1996 parcel data from 14 mailers. These mailers represent both large and small companies mailing diverse types of parcels (e.g., Compact Disks ("CD"), checks, film, and cosmetics). Table 8 below summarizes the pieces and weight for the mailers providing parcel data to me and compares the data I received to the USPS' total population of Standard (A) parcels:

Table 8
Comparison of RIAA, et al.
<u>Parcel Data to USPS Data</u>

Item (1)	RIAA, et al[1/] (2)	USPS[2/] (3)	Percent[3/] (4)
1.No. of Pieces (millions)	325,189	982,647	33.1%
2.Weight (millions of pounds)	231,411	512.877	45.1
3.Average weight per piece - (pounds)[4/]	0.712	0.522	136.4%

[1/] Exhibit __ (RIAA, et al-1F)
[2/] Witness Crum, USPS-T-28K Table 3, Distribution Keys line 1 and line 2
[3/] Column(2) ÷ Column(3)
[4/] Line 2 ÷ Line 1

The data provided to me by RIAA, et al. represents 33 percent of the number of parcel pieces handled by the USPS and 45 percent of the parcel weight handled by the USPS. The RIAA, et al. parcels have an average weight of 0.71 pounds per piece (i.e., 11.4 ounces) while the USPS parcels an average weight of 0.52 pounds per piece (8.3 ounces).

The RIAA, et al. parcel data has an average density of 29.9 pounds per cubic foot.[17/] This is significantly higher than the average parcel density calculated by the USPS in MC95-1 (14.9 pounds per cubic foot) or MC97-1 (8.1 pounds per cubic foot). However this differential is due, in part to the difference in weight. One method to correct this difference in weight is to adjust the density for the weight differential. This adjustment for weight yields an average density of 21.92 pounds per cubic foot.[18/] This adjusted density estimate for parcels is still 2.71

[17/] Exhibit ___ (RIAA, et al.-1F), line 40
[18/] 29.90 pounds per cubic foot x (0.522 ounces per piece ÷ 0.712 ounces per piece)

times larger than the estimate obtained in MC97-2 of 8.1 pounds per cubic foot and used by Witness Crum in the current proceeding.

E. CORRECTION OF CUBE DISTRIBUTION KEY

Based on the discussion above, the reasons why the parcel densities developed in MC97-2 are biased and unreliable are:

1. The time period is different than the time period for letter and flats;
2. The sampling methodologies are different between MC95-1 and MC97-2;
3. The sampling methodology in MC97-2 is shown to be biased by the laws of physics; and,
4. The data from parcel shippers demonstrate the bias in the MC97-2 data.

Therefore, I have concluded that the parcel densities derived using MC97-2 should not be used. The value for the density of parcels that is in the record in this proceeding and comparable to the estimated densities used for letters and flats is the parcel density estimated in the supplement to LR-MCR-13 in MC95-1.[19] While this parcel density is less than shown in the RIAA, et al. data, I believe it is superior to the data in MC97-2.

The estimate of parcel density for all Standard (A) developed in MC95-1 is 14.9 pounds per cubic foot. I have corrected the bias in Witness Crum's USPS-T-12 K by using 14.9 pounds per cubic foot for parcels in the parcel column of line "3. Density of Mail" in each of the four

[19] All three density estimates (letters, flats, and parcels) were developed using the same time period and the same methodology.

(4) subclasses of Standard (A) mail.[20] The changes in unit costs that result from correcting for these bias are shown in Table 9 below.

Table 9
Transportation and Delivery Service Unit Costs
Corrections for Parcel Density
(cents/piece)

Cost Segment	USPS-T-12[1]			Corrected		
	Flat	Parcel	Difference	Flat	Parcel	Difference
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. C.S.8 Vehicle Service Drivers	0.30¢	1.76¢	1.46¢	0.32¢	1.09¢	0.77¢
2. C.S.14 Transportation	0.71	7.08	6.37	0.78	4.56	3.78
3. Total	xx	xx	7.83¢	xx	xx	4.55¢

[1] Sources: Columns (2), (3) and (4) from LR-H-108: Revby96.xls, Sheet "All". Columns (5), (6), and (7) from LR-H-108: Revby96.xls with parcel density set to 14.9 in each of the four subclasses.

The difference in transportation and delivery service costs between parcels and flats was calculated by USPS to equal 7.83 cents per piece. When the parcel density is corrected, the difference in these costs equals 4.55 cents per piece. The net change in the difference between parcels and flats equals 3.28 cents per piece (7.83 cents per piece minus 4.55 cents per piece).

F. CONCLUSIONS

Based on my above analyses, the average density for parcels (i.e., pounds per cubic foot) is understated. The correct density for parcels should be based on the MC95-1 data of 14.9

[20] In EXCEL Workbook Revby96.xls dated 11/3/97, the following cells were revised to equal 14.9: BrCrt!F76, BrOth!F76, NpCrt!F76, and NpOth!F76 (See RIAA, et al.-LR-1, Spreadsheet 108_new.xls).

pounds per cubic foot. Utilizing this value to distribute volume variable costs between letters, flats and parcels, I have restated Witness Crums costs. Correcting for the bias in the estimate of the average density of parcels results in a decrease of 3.28 cents in the difference between the average cost of a parcel with respect to the average cost of a flat in Standard (A) mail.

STATEMENT OF QUALIFICATIONS

My name is Gary M. Andrew. I am a Senior Consultant with the economic consulting firm of L.E. Peabody & Associates, Inc. The firm's offices are located at 1501 Duke Street, Suite 200, Alexandria, Virginia 22314.

I received a Bachelor of Arts degree in Mathematics from DePauw University in 1961, the Bachelor of Science in Management Science from Case Institute of Technology in 1961, and the Doctor of Philosophy degree from Case Institute of Technology in 1966. My major field of study was operations research, with a minor in statistics. I also completed every advanced course in statistics and econometrics at Case Institute of Technology offered between 1961 and 1964.

At Case Institute of Technology, I taught courses in statistics, sampling and operations research, and worked in the Case Operations Research Group and the Case Statistical Laboratory on research projects in theoretical and applied statistics, including transportation problems. I was a member of a research team that developed one of the first digital computer simulations of railroad operations for a division of the C&O Railroad.

From 1964 to 1971, I taught courses and advised students and persons in business in theoretical and applied statistics, sampling, and operations research in the School of Business Administration and the Department of Statistics at the University of Minnesota, Minneapolis, Minnesota. During this period, I consulted with several railroads, truckers, airlines, and shippers and presented testimony before the Interstate Commerce Commission in numerous rate, abandonment and merger cases. I have also published articles and consulted on work sampling procedures. My consultations have included pricing decisions for several firms.

In 1971, I became Director of Planning and Analysis at the University of Colorado and, in June 1974, I was promoted to Vice Chancellor for Administration in charge of all support activities on the Boulder Campus. My responsibilities included estimation, justification, and cost control for over $50 million in construction for the University during my tenure. I also had responsibility for both the United States Postal Service installation on the Boulder campus and the private mail system for the four campuses. I was on the Graduate Faculty of the School of Business and continued my consulting practice in statistical sampling and estimation procedures in addition to my administrative responsibilities at the University of Colorado.

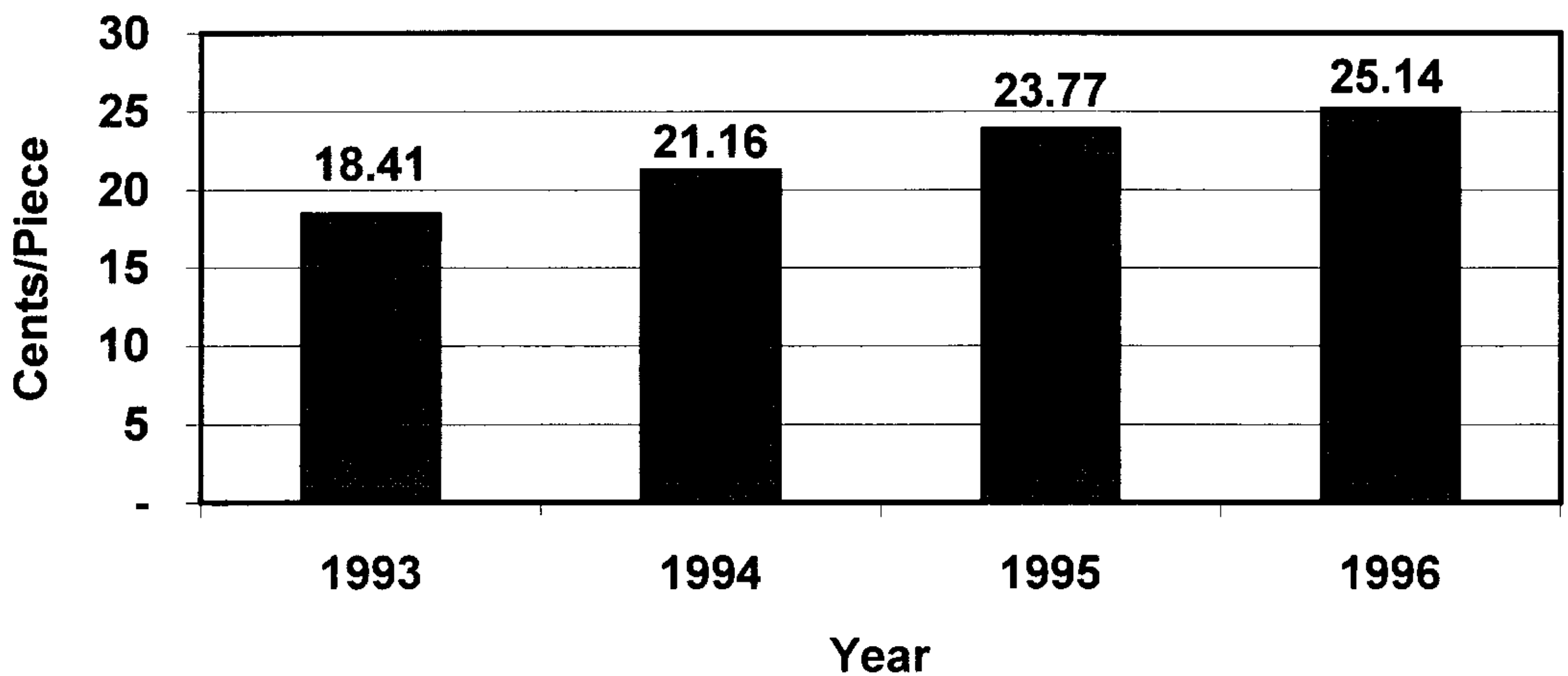
In September of 1978, I resigned my administrative position at the University of Colorado to devote full time to consulting and other business interests. I formed Infomap, Inc., a computer mapping and software firm specializing in the geographical display of statistical data, developed this company and sold it to Rand McNally and Company in 1983. I worked as Director of Internal Consulting for Rand McNally until 1986.

For 30 years, I have worked with the firm of L.E. Peabody & Associates, Inc. as a consultant on various special projects. In January 1988, I joined the firm as a Senior Consultant. My work with L.E. Peabody & Associates, Inc. has included the development of mathematical models of economic systems, statistical sampling procedures and statistical models for analyzing the relationship between costs and volumes in large data bases. I have, on numerous occasions, presented testimony in rate proceedings as an expert witness in mathematical modeling. I presented testimony on costing models before the Postal Rate Commission in Docket No. R90-1, Postal Rates and Fee Changes, 1990, and testimony in Docket No. R94-1, Postal Rate and Fee Changes, 1994.

I am a member of the American Statistical Association and the Institute for Operations Research and the Management Sciences. I have published papers on statistics in recognized professional journals, and have won awards for work in economics and statistics including the Carlton Prize in Economics at Case Institute of Technology.

I was a reviewer of and contributor to The Guidelines for the Presentation of the Results of Sample Studies, Statement No. 71-1 (Interstate Commerce Commission, February 1971).

Summary of Historical Difference in Revenue Per Piece for Parcels and Flats -- Standard (A) Commercial Mail



Sources: USPS-T-28K (formerly LR-H-108) and Attachment to Response to DMA/USPS-T-28-1

Excerpts

from

LR-MCR-13 in MC95-1

DENSITY STUDY DOCUMENTATION

1 PURPOSE

To provide a robust estimate of the relative densities of letters and flats for First-Class Mail and third-class mail in support of developing separate transportation costs for those shape-based cost categories.

2 RESULTS

The following table presents the results for selected categories of mail. The formulas used to calculate density, variance, and coefficient of variation are presented in Section 5, Analysis. The statistical programs are presented in the program documentation in Part III.

Class	Shape	Density (lbs/cubic ft)	Variance	Coefficient of Variation
First-Class Presort	Letter	24.2787	0.0394	0.00818
First-Class Presort	Flat	18.0650	0.1708	0.02288
Third-Class Bulk Regular	Letter	28.4219	0.0726	0.00948
Third-Class Bulk Regular	Flat	20.6526	0.4358	0.03196

3 SAMPLING PLAN

The universe for this study was all mail of the relevant categories and shapes traveling through the U.S. Postal Service system. The sampling frame included all Processing and Distribution Centers (P&DCs).

3.1 Site Selection

For purposes of determining the densities of the cost categories in Section 2, the sample of data collection sites was a judgement sample of nine P&DCs. Destinating mail was sampled so that mail from these sites would be representative of mail from other sites. The facilities included in the study were:

- Springfield, MA
- Philadelphia
- Pittsburgh
- Jacksonville
- Orlando
- Des Moines
- Denver
- San Diego
- San Francisco

Statistical Programs Coordinators (SPCs) at each site were asked to sample the same volume of mail each day for Monday through Saturday in a two week period.

3.2 Sample of Mail

This study used quota sampling, where, for each day, data collection continues until a predetermined quantity of each type of mail has been located and weighed.

3.2.1 Quantity

For each shape of mail, the SPCs were instructed to sample a specific quantity every day of the test. For letters, SPCs were to fill 18 letter trays, or between 10.8 and 16.2 cubic feet (depending on type of letter tray used). For flats, either 10 flat trays (12 cubic feet) or one pallet was specified.

For each category, between 10.4 cubic feet (one small hamper) and 65.7 (three large hampers) were sampled every day of the test. For many categories, more than one shape of mail was sampled.

3.2.2 Mail Selection

The SPCs were allowed to locate the shapes and categories of mail where they were able, as long as the mail was destinating in the facility's jurisdiction.

To select the mail to be sampled, the SPCs pulled full, or partially full, containers from the mailstream. If the container was partially full, the SPCs were instructed to try to fill the container with mail of the same category and shape from other containers. The SPCs were instructed to sample mail representative of its category in both size and shape.

A single category and shape of mail was weighed in a container of known volume. The category, shape, net weight, tare weight, and percent of space occupied by mail in the container were recorded. These records were used to determine the density (pounds/cubic feet) of the different subclasses and shapes of mail.

4 DATA COLLECTION

The SPCs at each facility were given data collection forms and procedure instructions to conduct the study. These forms and instructions are presented in Part II.

4.1 Data Collectors

SPCs were selected to conduct the density test because of their knowledge of mailflow and statistical techniques. The SPCs have experience conducting similar data collection and statistical tests. Their experience enabled them to locate mail by category and shape easily, and select and measure a sample quickly and accurately.

The SPCs were given a two-week time frame in which to collect six days of data. They were permitted to select a two-week period between the beginning of June and the end of July 1994 depending on their schedules. The test was conducted during the tours which would have the greatest volume of mail from which to sample.

4.2 Data Collection Forms

The SPCs were instructed to complete one data collection form for each day of the test. The forms specified the categories and quantity of mail to be sampled. The forms also identified the general type of container to be used to sample each shape and category and provided a code for the specific container used.

4

4.3 Data Collection Procedures

The SPCs received detailed data collection instructions, including how to:

- **Schedule the test.** The SPCs were instructed to perform the test within a two-week period for six days, Monday through Saturday. Data had to be collected that were representative of each day of the week to provide the ability to analyze density by day.

- **Fill out the data collection forms.** The SPCs had to copy the forms to have one for each day of the test. They had to record the date, day of the week, facility name, state, ZIP Code, and 3-digit ZIP Codes covered by the facility on each form.

- **Prepare for the test.** The SPCs had to obtain several letter trays, flat trays, and a portable scale.

- **Select the container.** The SPCs were instructed to use letter trays to test letters and flat trays to test flats.

- **Select the mail.** SPCs were instructed to sample destinating mail only. Destinating mail was defined as mail that was to be delivered by offices under the facility's mail processing jurisdiction.

- **Fill the container.** SPCs were instructed to load the mail of a particular category and shape into the appropriate container. If they found pre-containerized mail of one category and shape, they were allowed to sample that container. They were advised, however, to be sure that sampled mail was representative of the mailstream that day. The SPCs were to fill the container to capacity without packing the mail too tightly—to simulate the mail's normal position.

- **Weigh the container and record the data.** To complete the data collection forms, the SPCs were to weigh the filled containers and record the gross, tare, and net weight on the forms either in pounds and ounces or just pounds to the second decimal place. The SPCs were also instructed to record the container used and to estimate the percent of space occupied by mail in the container. They were to try to fill every container to capacity, or if an insufficient amount of the category or shape was unavailable, to use their experienced judgement to estimate the percentage.

The SPCs were instructed to continue filling containers with sampled mail until the required amount of measurements, according to the data collection forms, for each category and shape were recorded for each day.

At the end of the two-week test period at each facility, the SPCs should have had six complete sets of data collection forms, one representing each day of the week, Monday through Saturday. At that time, the SPCs were instructed to make copies of the forms and mail the originals back for data entry and analysis.

5 ANALYSIS

The density data for this study were analyzed using the Statistical Analysis Software (SAS). The SAS programs and data are presented in the Program Documentation in Part III.

5.1 Data Entry

Six sets of original data collection forms were received from each of the nine P&DCs. Upon receipt, the data collection forms were manually checked for completeness and logical accuracy. The data were key entered and checked for accuracy. The data fields entered included:

1.	Site	7.	Percent Full
2.	Day	8.	Gross Weight
3.	Class	9.	Tare Weight
4.	Shape	10.	Standardized Tare
5.	Container Code	11.	Net Weight
6.	Cubic Feet	12.	Density

For example, the comma-delimited text for First-Class Presort flats collected at Facility 1 on a Tuesday would be as follows (according to the order in the list above): AA, TU, 1CP, F, FT, 1.2, 100, 21.1250, 1.8, 1.875, 19.2500, 16.042.
1. 2. 3. 4. 5. 6. 7. 8. 9.
10. 11. 12.

5.2 Calculations

The density calculation is the simple division of net weight by actual cubic feet. The data collectors recorded the type of container used and the gross weight of the sampled mail and the container. To determine the net weight of the sampled mail, a standardized tare weight according to container type was subtracted from the recorded gross weight. The actual volume of cubic feet of the mail was calculated by multiplying the total cubic feet of the appropriate container by the percent with which it was filled with sampled mail.

To calculate the variance of the density using more than one variable, a calculated formula for the variance of a ratio estimator was used (where D=density, V=volume, and W=weight):

$$VarD=\frac{1}{n(\overline{V})^2}[VarW+D^2VarV-2DCov(W,V)]$$

The coefficient of variation was calculated by dividing the square root of the variance of the density by the density itself. The SAS programs used to perform these calculations are presented in Part III.

6

Shape-Based Density Study Data Collection Instructions

The Postal Service is considering changing the way that categories of mail are defined from a content-based system to a system based more on shape and mailstream. To make these changes, the Postal Service needs updated density information about the way mail actually moves on transportation.

The Shape-Based Density Study is modelled after the previous "Form 22" system but incorporates two significant changes:

- First, the new study requires density information to be collected not only by mail category (e.g., First-Class Presort, Second-Class Nonprofit) as in the old system, but also by shape.

- Second, the old system required that mail be dumped into hampers of a predetermined capacity which were then weighed. The new study requires mail to be weighed in containers that are representative of how the mail is transported. For example, since most First-Class letters are transported in trays, this mail should be weighed in letter trays.

In other respects, the study is similar to the Form 22 system, which used "quota sampling"—data collection continues until a predetermined quantity of each type of mail has been located and weighed.

Statistical Programs Administrators at Sectional Center Facilities (SCFs) and Bulk Mail Centers (BMCs) will perform new density tests on 6 days, Monday through Saturday. These tests may be performed over a two-week period, but must be finished within the two weeks. For example, if the test is omitted on one Tuesday, it must be performed on the next Tuesday to produce a data collection form that accurately represents mail density on Tuesdays.

Data collection procedures are slightly different at SCFs and BMCs. A description of the procedures for each type of facility follows. There are two data collection forms to be used for the test, one for SCFs and one for BMCs.

1 Sectional Center Facilities

Use one data collection form for each day of the density test. At the top of each form, fill in the boxes with:

- Date
- Day of the Week
- Sectional Center Facility name, state, and ZIP code
- 3-digit ZIP Codes Covered by SCF

The subclasses may be weighed in any order at any time of the day. Certain types of mail may be easier to find at specific times during the day. For example, Second-Class Classroom mail might only arrive once a day, at the end of Tour 2.

Required quantities of mail are specified for each subclass to ensure representative data samples of each shape of mail. For example, for First-Class Presort, 18 letter trays of letters, 10 flat trays of flats, and one hamper of parcels should be sampled. In some cases, mail volume for a subclass may be insufficient to sample the required amount. These situations are described below, under "Special Considerations".

The subclasses of mail to be weighed at the SCF are:

- First-Class Post Card
- First-Class Presort
- First-Class NonPresort
- Zone-Rated Priority Mail
- Second-Class Nonprofit
- Second-Class Classroom
- Second-Class Regular and Agricultural
- Third-Class Single Piece
- Third-Class Bulk Regular Rate
- Third-Class Bulk Nonprofit

1.1 Density Test Procedures

In preparation for the test, obtain several letter trays, flat trays, and a portable scale. A U-cart may be useful while collecting mail for the test.

For each subclass of mail:

1. Using the data collection form, determine the shape (letter, flat, or parcel) and required amount to be tested.

2. Select the appropriate container from the list below:

Shape of Mail	Type of Container for Test
Letter	Letter tray
Flat	Flat Tray
Parcel	Hamper

3. For each subclass of mail other than First-Class Postcards and Priority Mail, collect mail destinating within the jurisdiction of the SCF. Destinating mail is defined as mail that is to be delivered by offices under the area mail processing jurisdiction of the SCF.

   For Priority Mail, collect mail originating within the jurisdiction of the SCF (i.e., meeting any of the following requirements):

   - A postmark within the processing jurisdiction of the SCF

   - A point of entry within the processing jurisdiction of the SCF as determined from the mailing statement or permit authorization

   - Otherwise determined to have originated within the processing jurisdiction of the SCF, possibly by return address

There are no restrictions on First-Class Postcards. They may be sampled originating or destinating in the jurisdiction of the SCF.

4. Select and load mail of a subclass into the appropriate container. In many cases, mail pieces may be sampled in the containers in which they are found. For instance, full letter trays of First-Class mail may be selected and weighed without having to remove mail from the containers. Mail should be selected to be representative of its subclass in both size and shape. Avoid filling the container with pieces of identical size and shape. Fill the container to capacity without packing the mail too tightly. Mail should be positioned to reasonably simulate the position occupied when transported.

5. Weigh the filled container.

6. Record the following on the data collection form:

   - Container Code (see footnote on form)
   - Container Size (see footnote on form)
   - Percent Full
   - Gross Weight
   - Tare Weight
   - Net Weight

   Record weight to the second decimal or in lbs. and oz. (e.g., 16.75 or 16 lbs. 12 oz.)

7. Repeat steps until required amounts for the shape and subclass have been measured.

1.2 Special Considerations

Certain shapes and subclasses may be relatively hard to find. Personnel at the inbound dock may be able to identify these pieces as they enter the facility or know when the best time is to find them. Mail should be weighed and returned to the mailstream as soon as possible.

If an initial effort to find the required volume of certain subclasses is insufficient, subsequent attempts should be made during the same day.

If there is not enough mail to fill a container to capacity, volume estimates should be made and accounted for in density calculations. When a certain class cannot be captured or the volume is too negligible to be estimated, "0"s should be recorded for weight and actual cubic feet.

First-Class Postcard
Accumulating a sufficient volume of First-Class postcards may take more than one tour. They are to be weighed in letter trays. The required amount post cards is 3 letter trays.

Zone-Rated Priority Mail
For Zone-Rated Priority Mail, only parcels need to be weighed. The required amount is one large (42"x30"x30"; 21.9 cubic ft.) hamper. Full hampers may be selected from the input side of the sorting operation.

Forms 1, 2, and 3

from

LR-PCR-38 in MC97-2

Form 1

Piece Information: **Identical Piece Mailing (Complete this page only if the pieces in the mailing are of an identical size and weight).**

Instructions.

Select one piece for sampling and complete the table below. Since the mailing is identical, only one piece needs to be sampled.

Length (In Inches)	Width or Girth (In Inches)	Height (Rectangular only)	Weight (In pounds)	IOCS Shape (Choose one)	Content/Appearance of Piece	
			0.	O Parcel-Machinable	O CD Box	O Film Envelope
				O IPP-Machinable	O Video Box	O Tube/Roll
				O IPP-Non-machinable	O Check Box	O Clothing Bag
				O Parcel-Outside	O Other Box	O Prescr. Drug
				Is Piece Prebarcoded?	O Other (specify)	O Sample
				O Yes O No		

For Christensen Assoc. use only.

20758

Form 2

Piece Information: NON-IDENTICAL PIECE MAILING IN SACKS.
(Complete this form only if the mailing is non-identical parcel pieces that are in sacks).

Instructions.
Select five sacks at random. From each sack, select one piece at random to be sampled. Sample each of the five pieces on a separate row in the table below. If the mailing is in less than five sacks, sample one piece for each sack in the mailing and record the results in the table below.

Sample Piece 1

Length (In Inches) | Width or Girth (In Inches) | Height (rectangular only) | Weight (in pounds) 0.

IOCS Shape (choose one)
- O Parcel-Machinable
- O IPP-Machinable
- O IPP-Nonmachinable
- O Parcel-Outside

Is Piece Prebarcoded?
O Yes O No

Content/Appearance of Piece
- O CD Box
- O Video Box
- O Check Box
- O Other Box
- O Other (specify)
- O Film Envelope
- O Tube/Roll
- O Clothing Bag
- O Prescr. Drug
- O Sample

Sample Piece 2

Length (In Inches) | Width or Girth (In Inches) | Height (rectangular only) | Weight (in pounds) 0.

IOCS Shape (chose one)
- O Parcel-Machinable
- O IPP-Machinable
- O IPP-Nonmachinable
- O Parcel-Outside

Is Piece Prebarcoded?
O Yes O No

Content/Appearance of Piece
- O CD Box
- O Video Box
- O Check Box
- O Other Box
- O Other (specify)
- O Film Envelope
- O Tube/Roll
- O Clothing Bag
- O Prescr. Drug
- O Sample

Sample Piece 3

Length (In Inches) | Width or Girth (In Inches) | Height (rectangular only) | Weight (in pounds) 0.

IOCS Shape (chose one)
- O Parcel-Machinable
- O IPP-Machinable
- O IPP-Nonmachinable
- O Parcel-Outside

Is Piece Prebarcoded?
O Yes O No

Content/Appearance of Piece
- O CD Box
- O Video Box
- O Check Box
- O Other Box
- O Other (specify)
- O Film Envelope
- O Tube/Roll
- O Clothing Bag
- O Prescr. Drug
- O Sample

Sample Piece 4

Length (In Inches) | Width or Girth (In Inches) | Height (rectangular only) | Weight (in pounds) 0.

IOCS Shape (chose one)
- O Parcel-Machinable
- O IPP-Machinable
- O IPP-Nonmachinable
- O Parcel-Outside

Is Piece Prebarcoded?
O Yes O No

Content/Appearance of Piece
- O CD Box
- O Video Box
- O Check Box
- O Other Box
- O Other (specify)
- O Film Envelope
- O Tube/Roll
- O Clothing Bag
- O Prescr. Drug
- O Sample

Sample Piece 5

Length (In Inches) | Width or Girth (In Inches) | Height (rectangular only) | Weight (in pounds) 0.

IOCS Shape (Chose one)
- O Parcel-Machinable
- O IPP-Machinable
- O IPP-Nonmachinable
- O Parcel-Outside

Is Piece Prebarcoded?
O Yes O No

Content/Appearance of Piece
- O CD Box
- O Video Box
- O Check Box
- O Other Box
- O Other (specify)
- O Film Envelope
- O Tube/Roll
- O Clothing Bag
- O Prescr. Drug
- O Sample

20768

For Christensen Assoc. use only.

Piece Information: NON-IDENTICAL PIECE MAILING IN ALL CONTAINERS OTHER THAN SACKS.

Form 3

Instructions.

After superficially looking at the mailing, select the most common piece in the mailing. Roughly estimate the pieces of this type as a percentage of the total mailing. Sample this piece first and record the estimate and sample information in the first row of the table. Continue sampling the most common pieces in the mailing in the order of their occurrence until you have sampled a total of five (5) pieces. If there are fewer than five different piece types, sample only one of each type and record the estimate and sample in the appropriate line of the table.

Sample Piece 1

Piece type as % of mailing | Length (in Inches) | Width or Girth (in Inches) | Height (rectangular only) | Weight (in pounds) 0.

IOCS Shape (choose one)
- O Parcel-Machinable
- O IPP-Machinable
- O IPP-Nonmachinable
- O Parcel-Outside

Is Piece Prebarcoded? O Yes O No

Content/Appearance of Piece
- O CD Box
- O Film Envelope
- O Video Box
- O Tube/Roll
- O Check Box
- O Clothing Bag
- O Other Box
- O Prescr. Drug
- O Other (specify)
- O Sample

Sample Piece 2

Piece type as % of mailing | Length (in Inches) | Width or Girth (in Inches) | Height (rectangular only) | Weight (in pounds) 0.

IOCS Shape (chose one)
- O Parcel-Machinable
- O IPP-Machinable
- O IPP-Nonmachinable
- O Parcel-Outside

Is Piece Prebarcoded? O Yes O No

Content/Appearance of Piece
- O CD Box
- O Film Envelope
- O Video Box
- O Tube/Roll
- O Check Box
- O Clothing Bag
- O Other Box
- O Prescr. Drug
- O Other (specify)
- O Sample

Sample Piece 3

Piece type as % of mailing | Length (in Inches) | Width or Girth (in Inches) | Height (rectangular only) | Weight (in pounds) 0.

IOCS Shape (chose one)
- O Parcel-Machinable
- O IPP-Machinable
- O IPP-Nonmachinable
- O Parcel-Outside

Is Piece Prebarcoded? O Yes O No

Content/Appearance of Piece
- O CD Box
- O Film Envelope
- O Video Box
- O Tube/Roll
- O Check Box
- O Clothing Bag
- O Other Box
- O Prescr. Drug
- O Other (specify)
- O Sample

Sample Piece 4

Piece type as % of mailing | Length (in Inches) | Width or Girth (in Inches) | Height (rectangular only) | Weight (in pounds) 0.

IOCS Shape (chose one)
- O Parcel-Machinable
- O IPP-Machinable
- O IPP-Nonmachinable
- O Parcel-Outside

Is Piece Prebarcoded? O Yes O No

Content/Appearance of Piece
- O CD Box
- O Film Envelope
- O Video Box
- O Tube/Roll
- O Check Box
- O Clothing Bag
- O Other Box
- O Prescr. Drug
- O Other (specify)
- O Sample

Sample Piece 5

Piece type as % of mailing | Length (in Inches) | Width or Girth (in Inches) | Height (rectangular only) | Weight (in pounds) 0.

IOCS Shape (Chose one)
- O Parcel-Machinable
- O IPP-Machinable
- O IPP-Nonmachinable
- O Parcel-Outside

Is Piece Prebarcoded? O Yes O No

Content/Appearance of Piece
- O CD Box
- O Film Envelope
- O Video Box
- O Tube/Roll
- O Check Box
- O Clothing Bag
- O Other Box
- O Prescr. Drug
- O Other (specify)
- O Sample

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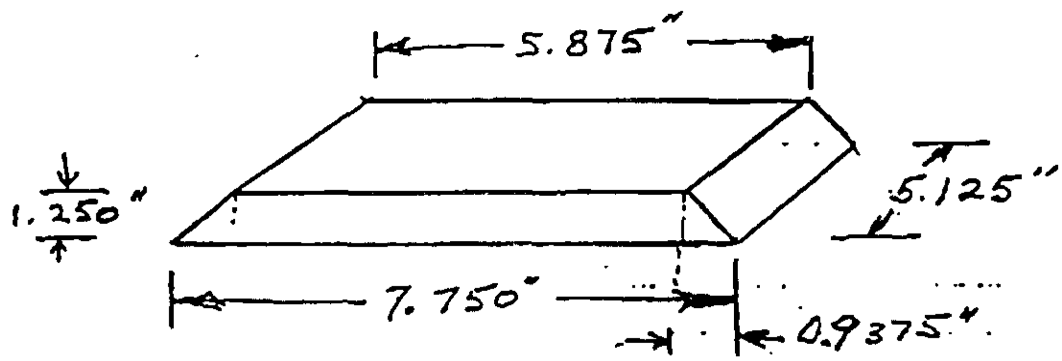
For Christensen Assoc. use only.

AMMA CRUM CROSS-EXAMINATION EXHIBIT 1

Parcel containing 2 CD's



XE-1
AMMA -X-1 WITNESS CRUM

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1/ Copies of these articles have been filed in RIAA, et al.-LR-1.
2/ These articles have extensive bibliographies.

Graph of the Cube/Density Relationship for a Parcel Weighing 0.77 Pounds